3 - Getting Started With a Mesh

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- *Structure & Economy*
- *Modeling Mechanics*
- *Creation and Extrusion*
- *Accuracy*

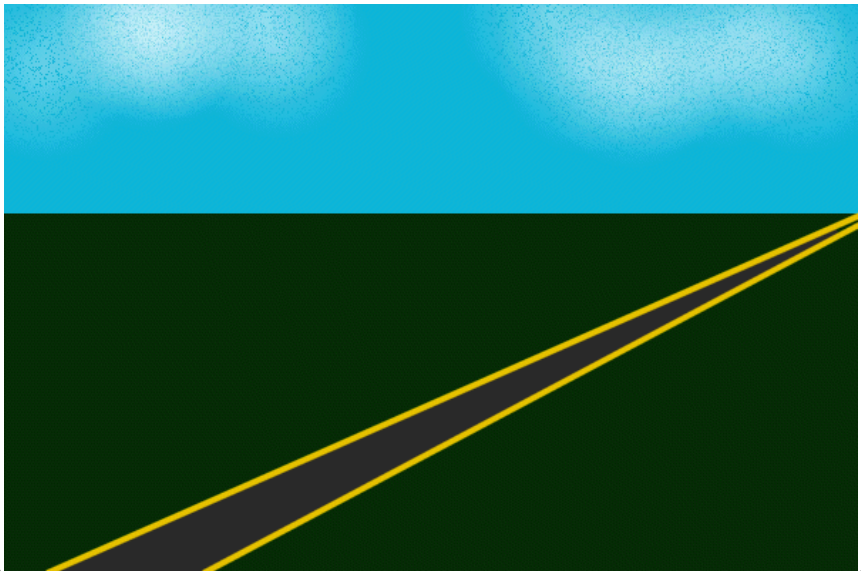
Ok now you're familiar with the basics of Z-Modeler, so let's get on to the application of your new knowledge. This chapter is directed primarily at makers of 3D cars, but this same concept could be applied to architectural, human, aircraft, even ship modeling. Since cars are my first love, we're going to focus on creating the most accurate, well-modeled cars we can. Sorry for those of you who may be using Z-Modeler for some other purpose (such as track modeling, which is entirely possible). Try and adapt it mentally as you read. To get us started, let's begin with a discussion of how you can get your biggest resources set up in Z-Modeler. These resources, of course, are Tracing Images.

Tracing Images and/or Blueprints

In this chapter, we're going to do something a little different. Since the biggest feature of setting up your new car is getting the blueprints to line up correctly, we'll go through that process step-by-step, showing you some tricks to get them lined up as expeditiously as possible. There will actually be two sets of instructions. One will focus on line drawings (no perspective) and photos (with perspective). First, though, some notes on finding data.

You have to work with a full set of information. Much as you may love the car you want to model, if you can't get any tracing photos or blueprints, then it's *highly* unlikely that you'll succeed at making a truly great car. You can't go into Z-Modeler and expect to just start clicking all willy-nilly and get an accurate representation of your desired car. Some sort of framework has to be established. You can take the pictures yourself, or you can draw the blueprints yourself (if you're an exceptional draftsman). However, for the rest of us, the internet is a good place to get the data we need. The places to start are blueprint and tracing-photo sites, like Swaq Valley, Scratch Made Cars, Onno Van Braam, Thomas Suurland, and there are several others. Also, you can try general car-interest sites such as Motorcities which may furnish a few choice perspective shots or even tracing images. Also, try a Google search for your car. But for now let's assume that you've got suitable blueprints or tracing photos.

At this point, I'd like to make an aside on the subject of perspective. Perspective is the difference between human and camera eyes and blueprint drawings. Simply put, it is the distortion that comes from seeing in three dimensions. When we look at the side of a car, the parts of the car that are farther away from us seem to be smaller than those that are closer to us. In fact, this is mostly how we can tell that those parts ARE farther from us, BECAUSE they are smaller. Take a look at this simple drawing:

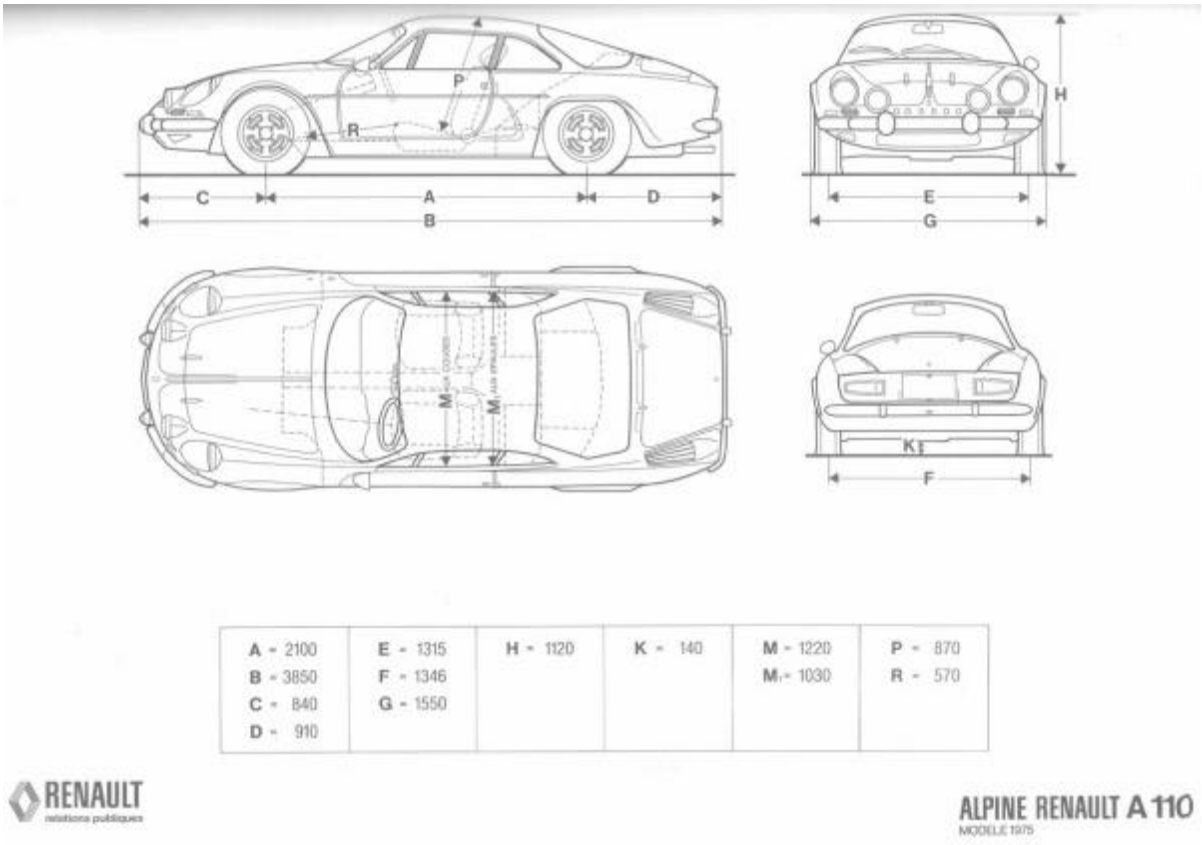


Assume that the grey area bordered by the yellow lines is a road. Now, the road seems to get smaller as it goes to the right. That's an example of perspective. In 2-D work, perspective is necessary to make images look real. You get the illusion that this road goes off into the distance, even though it's drawn on a flat surface. Another example is, when you look down the front of a car, standing on one side, the headlights farthest from you seem smaller than the ones closest to you. But you KNOW that the headlights are the same size. This is the effect of perspective, and it is present in hu-

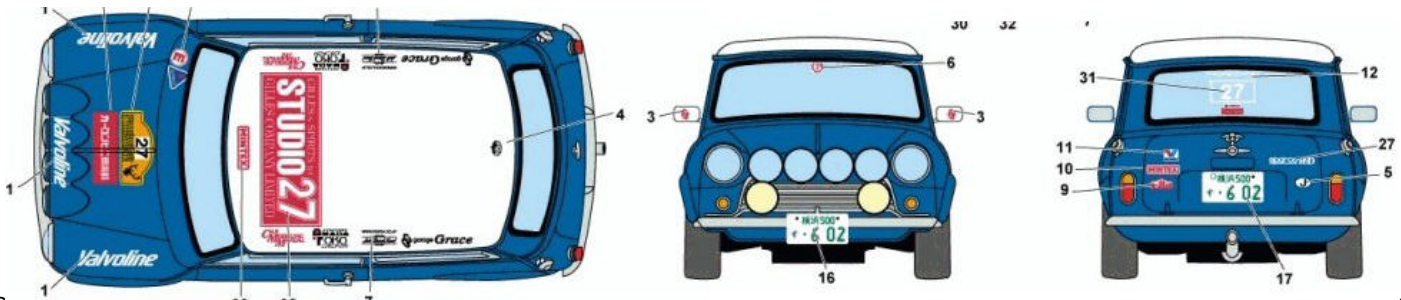
man eyes and camera eyes. This causes a major problem when lining up tracing photos, because, the general effect is, that, for example, your side view picture will not show the highest extent of the roof (which is in the center of the car) because the distance between the camera eye and the middle of the roof and the distance between the camera eye and the side of the car is different. Your front view, likewise, will show the roof as being far too low, because the distance is greater from the camera eye to the top of the roof than it is from the camera eye to the very front of the car. This effect CAN be minimized, by a combination of clever modeling, and good photos. With the right camera lens, perspective can be minimized greatly. However, blueprint drawings do not have this handicap. That is why I reccomend you use them if you can find them. This perspective not only wreaks havoc with your model's accuracy, but it also can (and will) cause problems with lining up tracing photos. But, those considerations become moot when we discuss loading blueprint drawings into Z-Modeler. Let's take a look at that.

Blueprint Drawings

In your search for your desired car, you may come across a true blueprint like this:



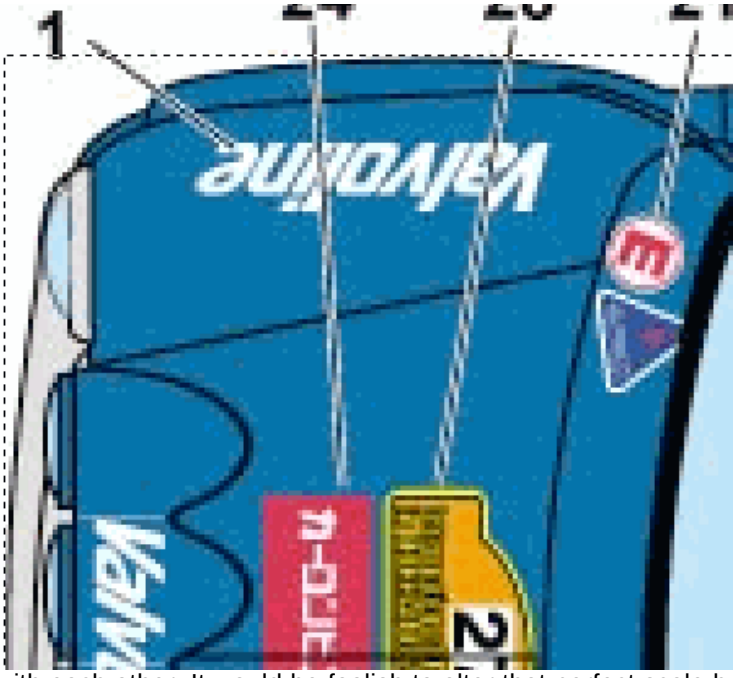
This is a bonafide, official blueprint from Renault Alpine, of the 1975 A110. If you can find something like this, it's sure to be 100% accurate, and may even give you dimensions (such as this one does). This is a beautiful thing. But it doesn't often work that way. More often you're getting "blueprints" from draftsmen who have reproduced the car you're looking for, or computer generated decal-placement drawings for scale models, which are still all right. I would estimate that they're about 90-95% accurate. They'd look something like this:



These actually turn out to be some of the best blueprints to work with. In any case, for the most part, blueprint drawings are

drawn to scale with each other. In other words, the height of the side shot and the height of the front shot are exactly the same. This makes lining them up virtually a breeze. I said virtually, didn't I?

Let's start the step-by-step project. First things first, find a blueprint at the sites listed above. Now, open it up in Paint Shop Pro, or whatever photo suite you use. The first order of business is to get all these views separated. You want a separate file for front, back, top, and side. For no particular reason, let's do the top view first. Zoom in tight on the image, and use the rectangular selection tool (with antialias OFF and 0 feather) to select the EXACT area of the car's top view. This means getting right down to the widest and tallest pixel in the image. Your selection should just barely encompass the entire car. It should cut nothing off and leave no extra space:

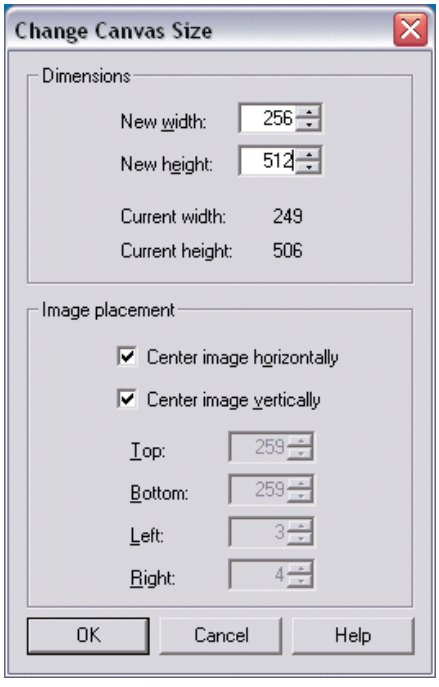


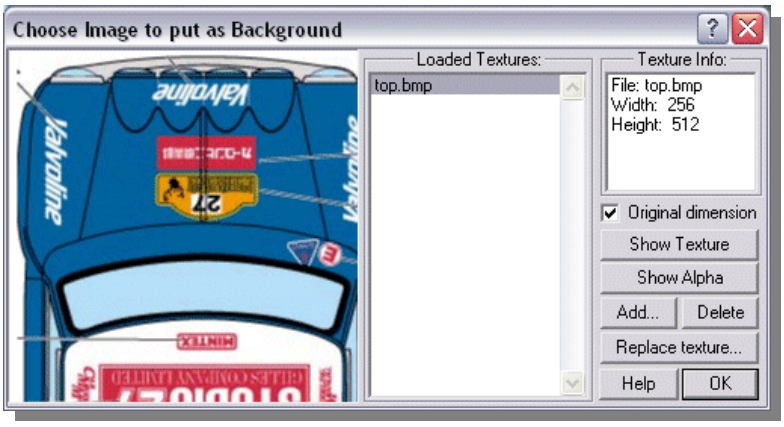
Here you can see my marquee (the border of the selection area) is around the top-left portion of the car, coming to the exact group of pixels where the car ends. This is important. When you have selected the car just so, copy it, and paste it as a new image. This image should just have the top view. But it's not ready to be loaded into Z-Modeler yet. First of all, it is laying on its side. For work in Z-Modeler, you will need your top tracing image to be oriented up-and-down. So, to easily fix this, rotate the image to the right 90 degrees. This will fix the first problem.

The next hang-up is that Z-Modeler will only load images that have dimensions of 256, 512, 1024, or 2048. So, there are many possible sizes for tracing images in Z-Modeler, from 256x256 up to 2048x2048. Taking this into account, we look at the top image we now have. If you are working with the same print that I am, you should have an image that measures 249x506. Your first reaction may be to scale that up to 252x512, or 256x520, but we're going to leave it. Why? Because the images in this print are all drawn to scale with each other. It would be foolish to alter that perfect scale by sizing one view down. That would mean that you would have to scale all the images down, which just adds another step to this already confusing process.

The rule when working with blueprints is, round up. Take those measurements and round them up to the nearest available dimension: 256, 512, or 1024. Then, instead of scaling it to that next available dimension number, use a command (in Paint Shop Pro) called "Canvas Size", which adds blank space around your image. This will bring up a box like this:

Now, since the dimensions are 249x506, simply enter 256 into the New Width box, and 512 into the New Height box. Then make sure the Center Image Horizontally and Vertically boxes are checked, and click OK. Now what you have is an image that is 256x512, with your top view of the mini perfectly centered inside it. That image is ready to be loaded into Z-Modeler. So save it as a format that Z-Modeler can recognize, either TGA, BMP, or PNG. Now, you need to load it into Z-Modeler. So open up a new file in Z-Modeler, click on the menu for the top view, and choose Background-->Image... and you're confronted with the image loading dialog box:





This box will let you load the image. As you can see, I already have. You will want to click the Add button, navigate to where you stored your image, and choose it. As you will see, it shows the width as 256 and the height as 512. Now, click OK. You will see the Top blueprint picture appear in the top view! But there was trouble in paradise. As I looked at this image in the window, it looked good, but I could see a problem. The middle line on the hood did not line up with the origin in the Z-Modeler window. This would have made lots of problems down the road, so I decided to fix it. This was rather easy. All I had to do was go back to Paint Shop Pro, select the whole image, and move it to the RIGHT two pixels. This is easiest to do at high zoom. When I saved the image again, it lined up perfectly. Now, it's truly ready for your budding modeling skills . . . you just have to repeat the process for all the rest of the views, front, back, and side. To help with that, let's recap this section with a ramble-free list of steps.

1. Find a suitable blueprint.
2. Load it in Paint Shop Pro (or equivalent)
3. Select one view of the car EXACTLY to the extents of the car.
4. Copy this and paste as a new image.
5. Rotate the image to the correct orientation if necessary (this won't be necessary for the side, front, or back).
6. Choose the correct dimensions for your image, in increments of 256, 512, or 1024 pixels.
7. Use the Canvas Size tool to make your image to those dimensions.
8. Make sure the image is centered in the canvas.
9. Load it in Z-Modeler using the menu at the top-left of your desired view.
10. Check that it lines up to the center.

Since with this section, we were dealing with blueprint drawings, which are properly scaled to each other (most of the time) it was a no-brainer. If you thought this was hard, give yourself a breather before reading the next section, on Tracing Photos.

Tracing Photos

Using photos instead of blueprints invites headaches galore, but is sometimes the only option, and can still help you produce the highest-quality meshes. Now, the basic method for making photos into Z-Mod-usable images is the same as for blue-prints, with some additions. So keep the above seciton in mind as we talk about some of the problems usually unique to the photo method.

Rotation/Skew

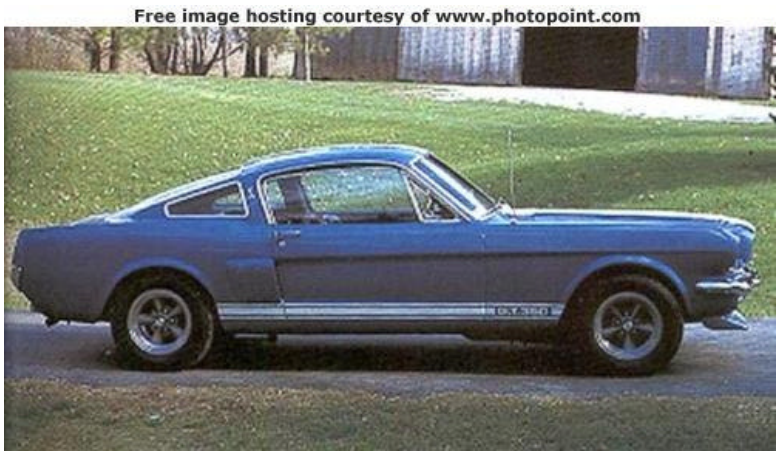
Sometimes your individual views of the car will be slightly cocked, tilted one way or another. This requrires you to balance it, making a level photo to use. For this, there's an easy method that I find 100% effective. All you have to do is find one feature of the car which is supposed to be exactly vertical or exactly horizontal. For cars with normal suspensions and on flat ground, you can use the bottoms of the tires. Take the rectangular selection tool and make a selection from the bottom of one tire to the bottom of the other. If they line up precisely, then you know that your image is properly rotated. Another good feature to use is the bottom of the car's door. These are almost always straight, level lines. For the top view, you may have to get more creative. If you can find the center of the hood (via a hoodscoop, or stripe for example) AND the middle of the trunk (by an emblem, or striping) you can see if the left (or right) edges line up. If they do, then you're good to go, and if not, then you need to rotate by a small number of degrees (perhaps fractions of degrees) using your photo editor's rotate command.

Angle

Additionally, you have to consider whether or not your photo is taken directly from the side, top, front, back, etc. For example, this photo is useless for tracing purposes:

That's an easy example. The shot is, of course, too high to be used for a tracing image. Your images have to be dead-on centered on the car, and can't be from any kind of angle in order for them to work correctly.

Take this mustang as another bad example:
Notice how this shot is just a little too high, and it shows you a little more of the front than it does of the back. That means that the photo was taken from too close to the front of the car to be of use to us. It's still probably good for texture or just plain details, but don't trace from it. Now I want to show you a perfect side tracing image.



Notice that, with the RSX, you don't see any more of the front than the back, that it is taken from the car's vertical and horizontal center. It's not even skewed all that badly. The only drawback is it's relatively low resolution. So, you have to weed out the unsuitable tracing images that you will find. Unfortunately there's nothing you can do to alter that bad angle.

Perspective

The next problem to overcome is that evil perspective. Look at this admittedly perfect front tracing image:

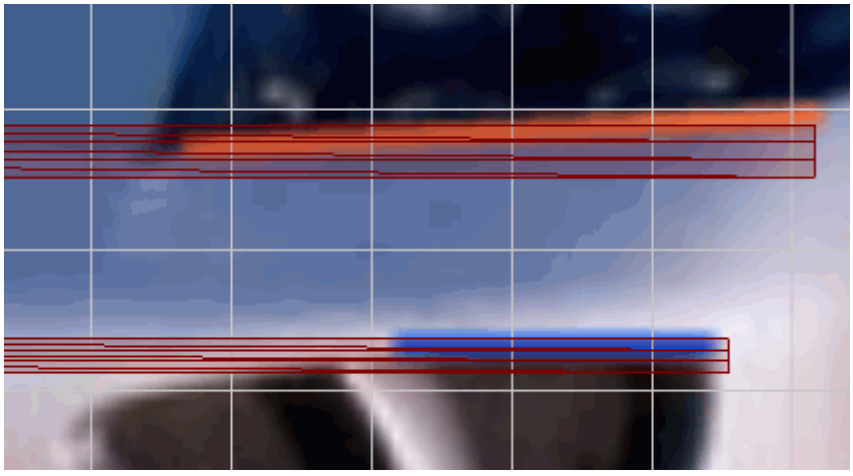
The front details, from the headlights forward, are perfect for our use. However, what if you try and line up the roof with your side tracing photo? Then your width will be way off, because the roof is not actually that height. It is actually taller than that, so lining it up can be a pain. How do we do it? We line up the elements that are the least perspectived. On the front image, we can count on the bottom of the headlight bezel, and the top of the side-front scoops to have very little perspective. Take a look at these two images:

The two orange lines are corresponding spots on the images. The bottom of the bezels are highlighted in orange, and the scoop tops are in blue. Now we have to get these lined up in Z-Modeler, which is the hard part. Here's how I would do it. Follow along with these steps, and we'll both go from there. If you need to refresh your memory about how to do any of these, look back in this chapter.

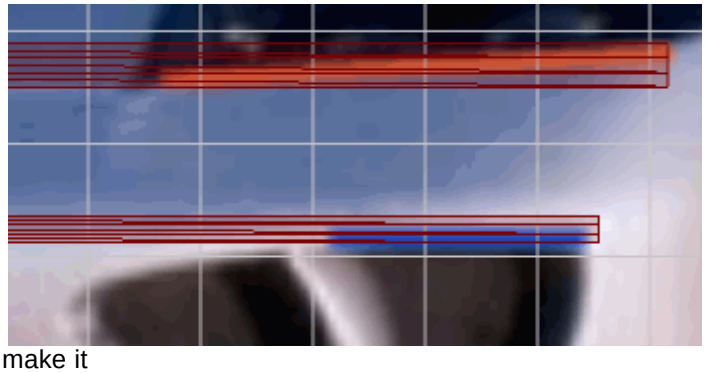
1. Save these altered photos of the Saleen S7.
2. Convert them to Tracing images as shown before.
3. Load them into the appropriate views in Z-Modeler.

Now, in order to line these up, we need to make some reference points in the views that we can use to compare the images to each other. To do this, the easiest thing to use is the command Create-->Surfaces-->Flat. Activate it, and then draw a flat surface on the side view around each of the two lines. Now, these flat surfaces will be at the origin. We want to pull them out, to the left or right, to a place where we can see them on the front view. Additionally, we want to see more than just a vertical line, so we'll switch to Vert Mode. Click on one of the surfaces, in the side view, and select one vertical column of verts. See this picture.

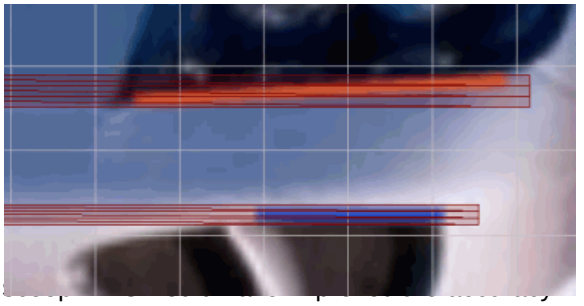
The reason we want to select that particularly, is because we're only going to move part of the surface out to the corresponding line on the front view. This will help us see more clearly. Next, go into the front view. Now, use the Modify-->Move tool on the X-Modification axis to move the selected verts out to the Orange line in the front image. It should look somewhat like this:



The two lines miss, and just barely. If you recall, the surfaces we drew corresponded to the top and bottom edges of the lines in the side view. This way, the bottom of your surfaces should line up to the bottom of the lines in the front view, and the tops of the surfaces should match the tops of the lines. As we can see, the image appears to be too high, by about two or three pixels. We can easily do this in Paint Shop Pro. Use the rectangular selection to select the area around the car, then float and move the selection down two pixels. This is best done on high zoom, to ensure accuracy. Now the lines line up much better. Look:



This is close, but I think the front tracing image could slightly benefit from being smaller. So, there are two ways of doing this, but the method which is actually quite easier is using Z-Modeler's in-house scaling tool called "pixels per unit". Remember that from Chapter 1? It scales the image based on how many pixels make up one of Z-Modeler's measuring units. The default is 128, and if you make the number larger, it scales the image down, and if you make it smaller, it makes the image bigger. This works well because it doesn't' change the quality of your image, just it's size in the view. I tried a factor of 132, and got the following result:



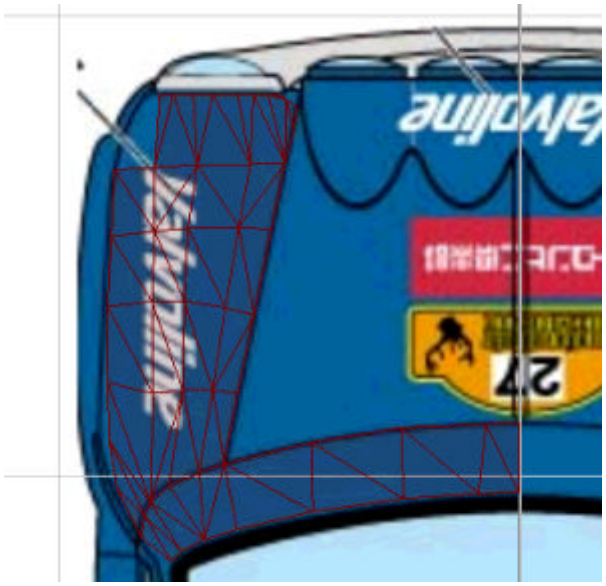
This is quite good! It seems to line it up pretty well, and I'm satisfied. However, this was an easy example. You may have to use more drastic scaling and moving techniques to line your set of images up. That's okay too. Another thing to remember is, the more reference points you use, the more accurate your tracing images will be. For example, you also could have used the top edge of the back "gill" fin just below and to the right of the front [illegible] of our experiment. Another tip to remember is, only choose reference points that have no perspective. For instance, in this last example, I would not have chosen the top scoop on the roof as a reference point, since, in both images, it suffers from perspective. Enough already! I'm sure you're sick of reading about setting up the mesh, and so I'll quit boring you. I know that you want to start placing polys right now, so you can have a model done by this evening. Did I ever tell you that patience is a virtue that's invaluable in 3D modelers? Before we start making polys, let's discuss modeling techniques and strategy.

Modeling Strategy

Let us clear up some misconceptions you may have about learning to model in 3d. It's not easy. There are many concepts that you must use in balance. The basic principles are: Top-Down modeling, Intelligent Poly Structure, Poly Cleanliness, Part

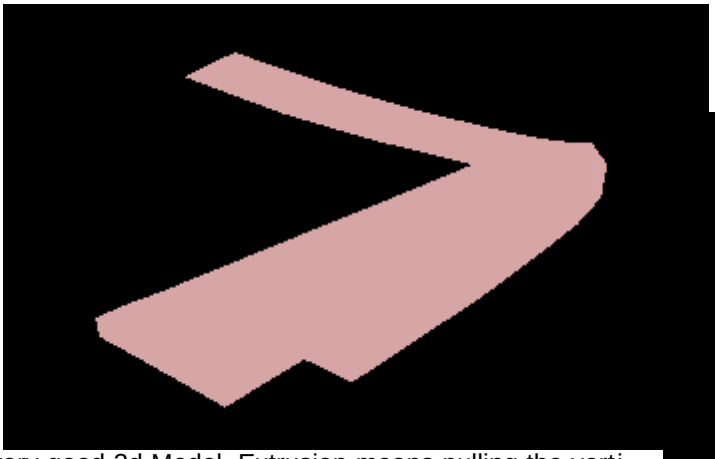
Separation, Representative modeling, and the ever-present Poly Economy. We'll discuss these in detail, and also talk about how to keep them in balance with the others, and what can happen if you don't. Remember, most of these concepts can be taken too far, so use them in moderation.

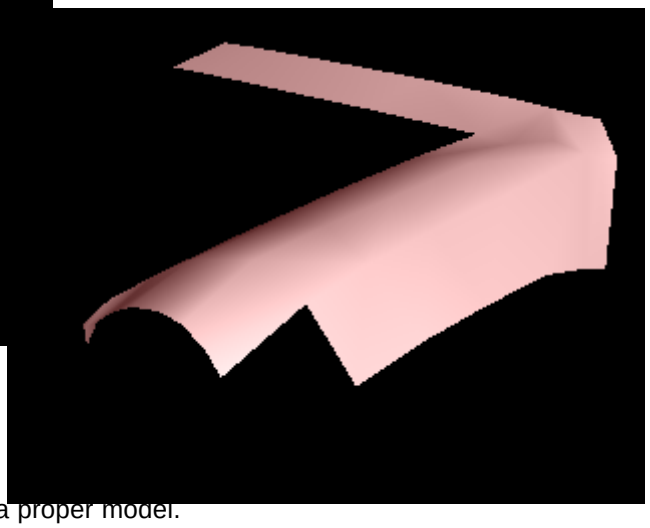
Top-Down Modeling



The most common tracing photo to find is the side shot. Most of the time, we can find this picture, and nothing else. Because of its plentiful nature, it's most often the place people start (I know I used to). However, one of the people I first learned from, CPD, models from the top down. It's really the best way to do it. If you model from the top of the car down, you will most likely wind up with a more detailed, more well-thought-out mesh. I usually start from where the hood meets the windshield, and work my way across, until I have finished the hood. This is one of the most rewarding parts of the car, because, when you model from the top, it makes it much easier to *extrude* your mesh. Extrusion is the process of adding the third dimension to your mesh. Take a look at this shot here:

It looks nice. But it's flat.





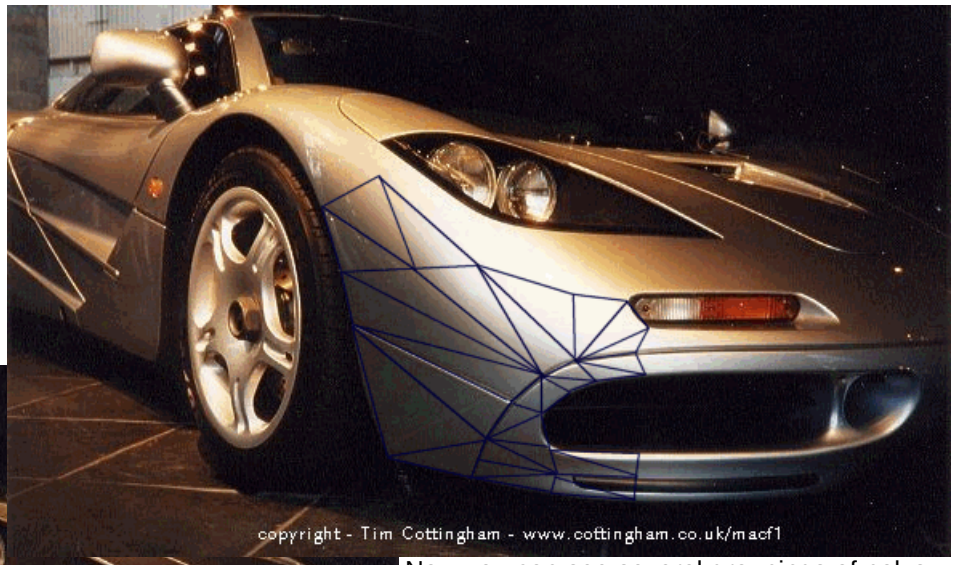
That's not a very good 3d Model. Extrusion means pulling the vertices from this object up or down to their correct heights. The reason that this is easier when done from the top, is because you can use the side view to find the outer edge of the hood, and extrude directly to that as a guide. From there, you can use the front view to get the contour of the rest of the hood. When extruded properly, it looks like a proper model.

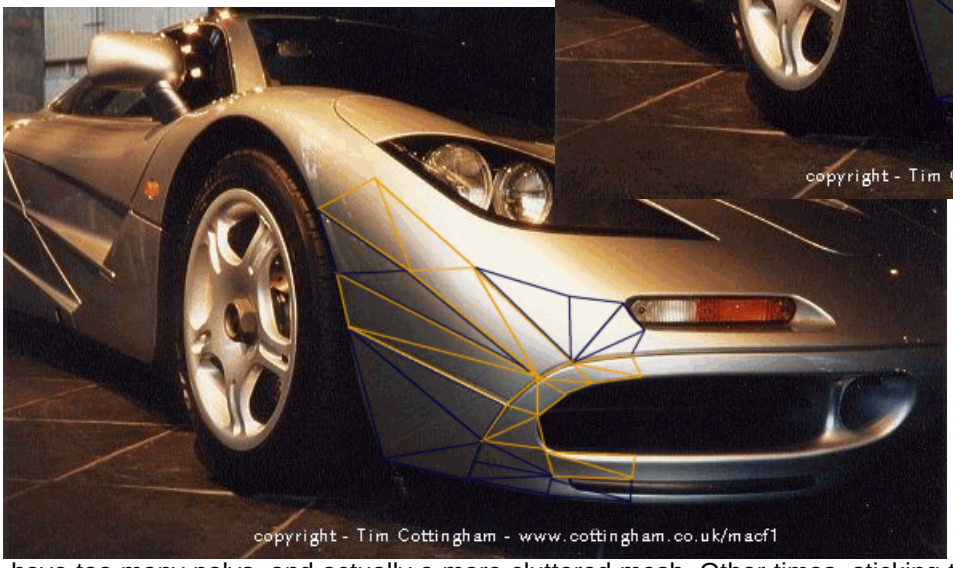
This is perhaps not the best mini cooper model out there, but it's a start. In any case, you can now see the depth of the car, properly extruded. Another advantage of the top-down modeling process is that top photos (if that's what you're using) generally have less perspective than the other views. Also, you get that crucial side contour, which can only be seen from the top. It is much easier to have that modeled in from the start than to try and add it later, when extruding. In any case, this technique really can't be abused as far as I know, although if you don't HAVE top pictures, then you can't use it. However, I've found those hard-to-find top shots to be invaluable.

Intelligent Poly Structure

When starting out, many new modelers fall short in one area: their meshes lack a *logical, clean, thoughtful poly structure.* This is one of the things that separates the men from the boys. When you start modeling, you have to think ahead. You can't just go in there and start placing polys wherever it seems appropriate. You have to think about what these polys will connect to, how much detail you will need, and how your poly structure can do justice to the contours of the car in *all three dimensions.* This requires you to think in a new way. It's been said (by me =)) that you're a modeler at heart when you look at things around you (particularly cars) and can see them as polygons. If you can look at a car, and see how your poly structure would look, then you've got good vision for modeling. At first, you may think this is a skill that you just have, or you don't. Actually, you can practice it on photos on your computers. I do it all the time. The next page has an example.

In this picture, I've opened up Paint Shop Pro, and used Draw-->Single Line in a constrasting color, to sketch out a mesh. This is a great method to use because it's WAY easier than actually modeling the car, and you don't have to have any other pictures of the car to do it. It's actually a lot of fun, but it serves a purpose too. Another thing you may notice about the picture above is that many of the polys seem grouped together in rectangles. I've highlighted them here:

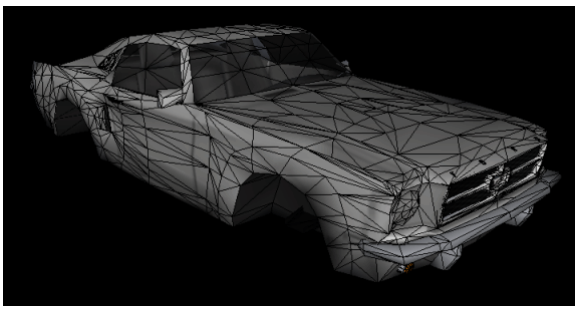




Now you can see several groupings of polys that make rectangles. This lends to a clean mesh. Rectangular poly structure is a great help in making an accurate mesh. It has another benefit as well. Rectangular groupings of polys tend to have much better normals, and far better environment mapping reflections than an unstructured polys. For the most part, you should try and use rectangular groupings as much as possible. However, it can be overdone. In certain places, using rectangular groupings will lead you to have too many polys, and actually a more cluttered mesh. Other times, sticking to the rectangular system will make it awkward to fit in details. Thus, as you can see above, there are many places where I used different poly structures to match the shape of the car. Close to the turning signal, you can see how I could have put in a lot of polys to make nice, clean rectangles, but it just wasn't necessary. That's a fan structure you see there. So, use the rectangular structure, but don't overdo it. I've seen meshes that, the more I looked at them, the more it looked as though they made a large flat surface with many vertical and horizontal steps, and just extruded and shaped it. That method leads to uninspired mesh design. You might as well throw a sheet over a car, douse it in hair spray, and then paint the car's details onto the sheet. The bottom line about mesh structure is: use you head. Think ahead about what you're making, and what kind of detail you'll need to create in order to best serve your mesh down the road. Visualize what kind of detail you will put into the mesh at different crucial spots, and put that vision into action.

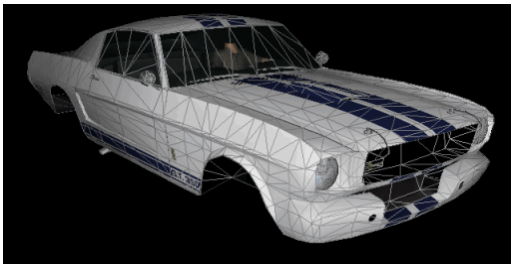
Poly Cleanliness

Building on this concept of well thought-out strategy for modeling is another, related concept of poly cleanliness. Keeping your mesh as uncluttered as possible is a major benefit, since it no doubt will look better, and will make it easier to modify. Reproduction of a car in 3d is a very precise operation. It requires low tolerances and margins of error. If you tend toward rectangular poly structures and make an extremely accurate mesh, then you shouldn't have any problem with keeping your mesh clean. However, you can put in too many polys for a specific surface. For example, if something is perfectly flat, then you can use two (or one) polys to model it. Unnecessary polys not only pump up your poly count, but they make your mesh messy. Also, you have to realize that no matter how good your mesh is, you WILL modify it, so if you make it too incomprehensible and messy, then you'll only cause yourself headaches down the road. I can't stress poly cleanliness enough. Let me show you a couple of pictures to shock the sense of it into you:



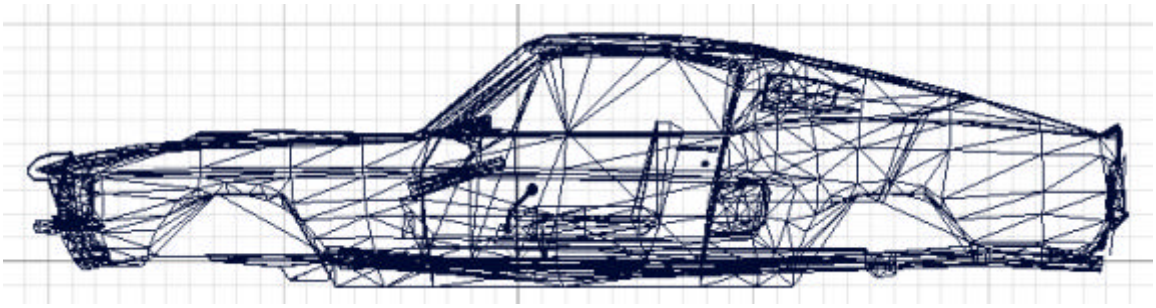
Messy

Clean



Part Separation

Another modeling practice that will serve you well is Part Separation. Simply put, *don't model everything into one object!* One of the worst things to happen is to be afraid to have too many objects in your Z-Modeler file and ending up with a car's exterior, interior, suspension, trim, windows, and driver all modeled into a single part. If I somehow lose the copy of the file that has my car all separated into different parts, it is a catastrophe. Having many parts is not only good for your normals, but it allows you to edit parts of the mesh freely, without looking through too much clutter. For example, look at this picture of my GT500:



That's 4800 polygons all in your face. It would be hard, but not impossible, to modify just one particular vertex in that mesh. The reason it's not impossible is because it's a clean mesh (see above). However, this mesh is separated into 33 different objects. This makes it simple to edit only what I need to. However, the parts are not separated at random. For example, the bumpers are a separate part, just as they would be on a regular car. The spoiler is also separated, as are the headlights, all the chrome, the windows, and the interior. The seats inside the interior are even separated. However, you can go too far with this. Separating EVERYTHING will only make you have hundreds of objects, and will make for bad normals. Separating parts for normals' sake will be discussed in the chapter on (surprise!) Normals. However, certain reasons for separating parts can be explained by a concept I call representative modeling.

Representative Modeling

When you make a model of something in 3d, you can never fully represent it. You will never be able to model each and every detail that is present on the real car, which, for example, includes corrugation of the turning signal lens, screws that hold the side mirror on, the wiring inside the dash, and so on. These things are obvious, however, it should not keep you from making your model reasonably anatomically correct. In other words, if a certain feature is visible, it is best to construct it with polys as it actually is on the real car. An example is window trim. You can sacrifice quality and accuracy by not modeling chrome and/or weather stripping in, or you can spend a few extra polys and make your model have a cool feature. Take for example my 1967 GT500. I knew that the window trim contained a strip of chrome on the frame around the door, and then a black strip of rubber on the inside jamb of the door, and then that the door itself had a strip of chrome going around the outside of it. This made a three-tier window chrome. Therefore, I decided to model it just like that. As a result, it looks really nice:

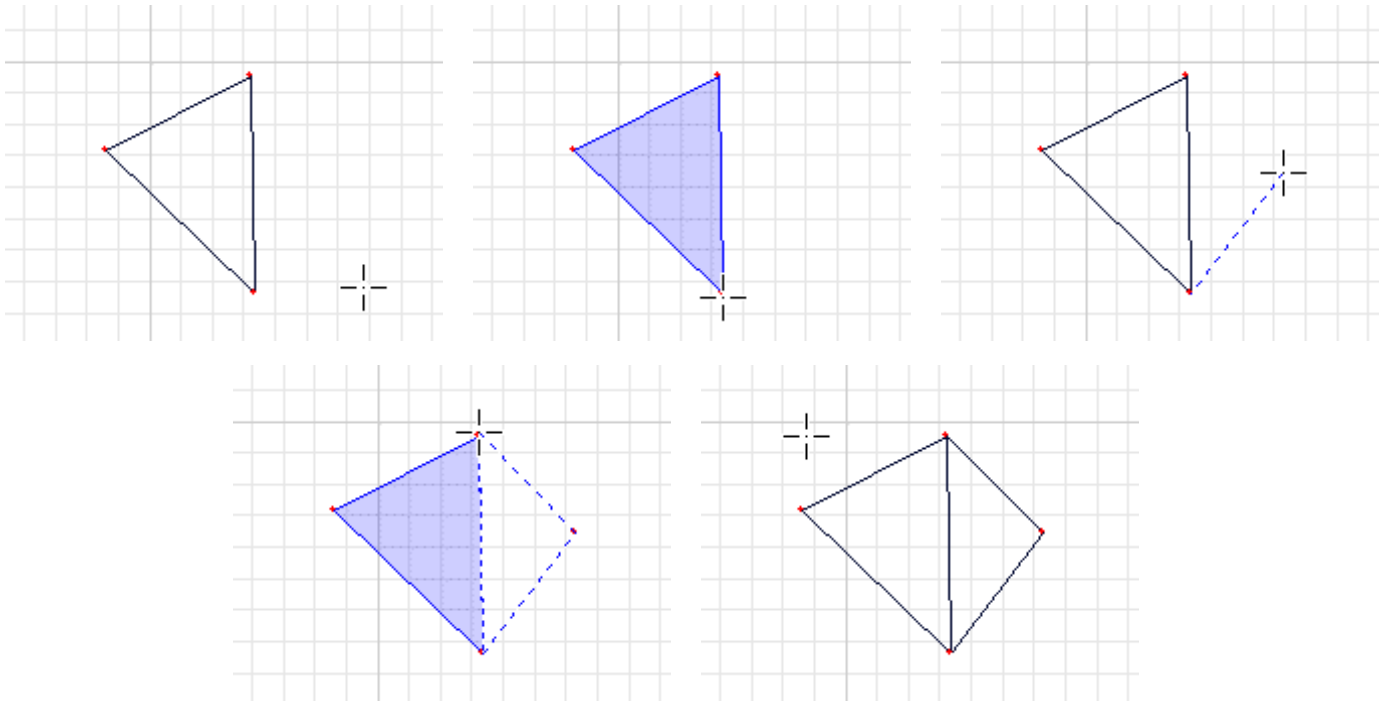
So, where it is possible, I always find it best to place my polys in such a way as to accurately represent the structure of the car. In that way, you can actually count on better environment mapping reflections and normals. However, this can obviously go into overkill, and quite easily. It can cost you dearly in the amount of polygons in your model. This will cut down on performance in whatever application you use your models. So, you have to keep it in balance with our last concept, the dreaded poly economy.

Poly Economy

There are two types of modelers in the world. There are some who embrace poly economy, who actually like to model with as few polygons as possible. Then there are others who hate poly counts, people who throw caution to the wind and just pump in all the detail they want. The latter are the people that end up with 25,000 poly cars. Granted, these cars look great on renders, however, they will kill the average man's video card. For game-oriented modeling, it is best to have some kind of poly limit. Personally, I thrive with poly economy. I start a project with ideas of how I can keep up a good amount of detail with the least amount of polygons used. I also have to limit myself, or I know that I will use Representative modeling to create a 200,000 poly model of a car that I love, which will do me absolutely no good. So, poly limits are good, to a point. You want to be concise with your use of polys. For example, don't use 25 polys for something if you won't be able to tell the difference if you used 5. Also, remember that there is virtually no good reason to make a flat surface with a lot of polys. OK, finally, you're "ready" to start modeling in Z-Modeler. Or so you think. Unfortunately there's no substitute for experience, and you will have to learn some things on your own. But for now, you'll have to just jump right in. Let's go!

Creating Faces

Now, for all the trash I've made you read, the process of creating polygons is surprisingly simple. You only have to make a maximum of 3 clicks per poly. However, there are some ground rules, and good tips I want to give you here. First of all, you cannot create a new Z-Modeler file with no objects in it, and just activate the Create-->Faces-->Single and start clicking away. You have to start with some kind of object, and create polygons inside of that object. This is also quite simple. You just activate Create-->Surfaces-->Flat, and create a flat surface somewhere off of your blueprints. Now, activate Create-->Faces-->Single, and click on the flat surface you just created. Now you are in the Vert mode of that object. You can create faces by clicking on three different points in space. You are really setting the positions of the vertices that border your polygon. You can click either on an existing vertex, or you can click where there is no vertex. The latter will create a new vertex at that spot for you. Check out how it works when you click on existing verts:



You have to be careful, because sometimes, you may think that you are clicking out in space, because your mouse is not directly over another vert, but if another vertex is lit up in blue, then that vertex is really *active,* and if you click when a vertex is *actrive,* then Z-Mod will use that vertex in creating the face. You also should be sure that you are connecting your faces to the right vertices, because at times the interface can be cluttered and confusing.
Another thing that is important when making a new mesh, is picking the right starting point. Most people develop their own favorite place to start modeling. Mine is the hood. Since I favor the top-down approach, I like to model a car from the center of the hood outward. You can try several other spots to see which ones are the best. Also, remember that you can leave the front if you're at a tough spot and go work on the back and vice versa. The car does not necessarily have to be modeled sequentially. However, there should be some kind of similarity between modeling styles, and levels of detail, among the different parts of the car, because it would look bad if you did the rear with a great amount of detail, but the front with very little, and so forth.

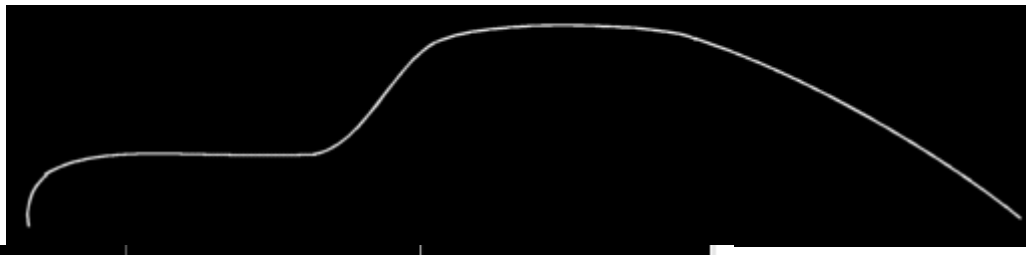
Extruding

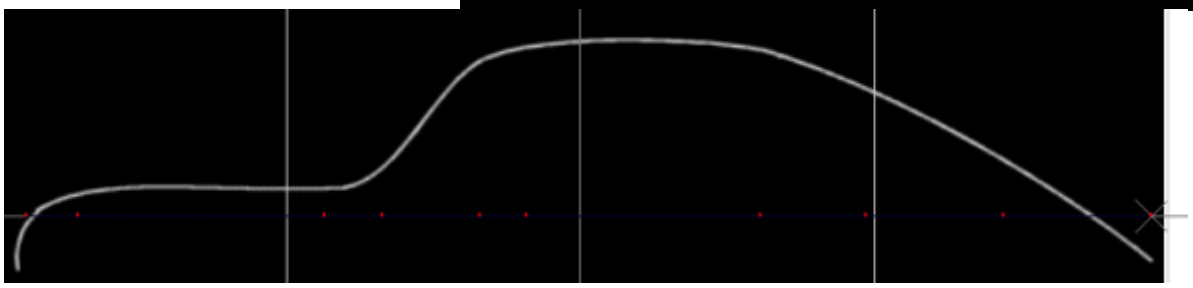
Okay, so now you've got faces on the screen. Don't feel too proud yet, because they're still flat. Why? Because, whatever viewport you created the polygons in, you could only do it in 2 dimensions. You created the respective height and width of the surface, but not the depth. Obviously, you'll have to add the depth in another viewport. This is possibly one of the hardest things you'll have to do. I really cant stand extruding. But I'll try and help you make it as painless as possible. Here we go:
The concept of extruding is simple: You add depth by moving verts from the object along the relative "Z" axis of the viewport you created the surface in. What does that involve? Let's look at two ways of extruding an object.
The first way you could extrude vertices is by using Z-Modeler's Z modification-axis. If you use this in the viewport you created the faces in, you can move them along the depth axis. You won't see any changes in that view, but you will in the others.

The second method is to leave the view you created the verts in, and go to another view. There you have to translate what the "Z" axis in the creation view means in the view you switched to. For example, if you created faces in the top view, and you wanted to move them along the Z axis in that view, then you would want to move it along the Y axis in the front or side.

The first method has several drawbacks, including the fact that you have to work in one view, while watching another. Moving along the Z axis is also counter-intuitive, and is quite confusing, so I suggest we stick with the second method. Let's assume that you have created the top view of a car. Let's also assume that you have this side-view blueprint:

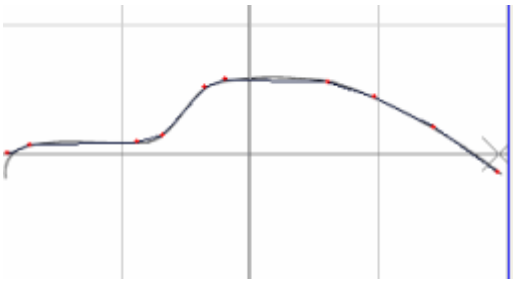
You want to extrude your mesh onto that blueprint, so you switch to the side view, where you can see the blueprint, and it should look something like this:

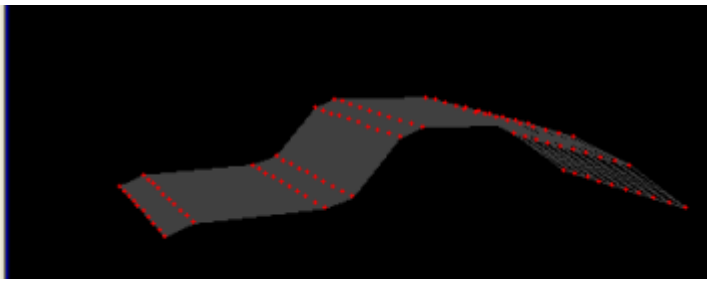




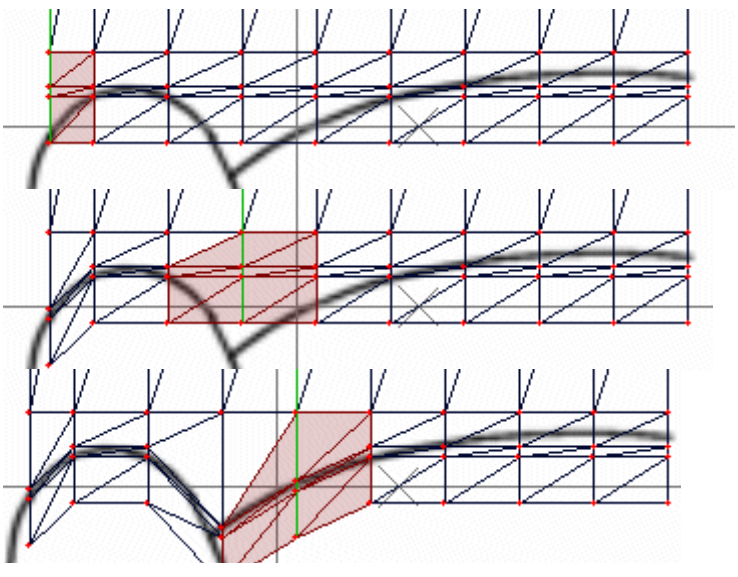
You can see that everything is just lined up at the origin. So, since this was created in the top vi ew, you would switch to the Y modification axis, turn on SEL mode, and select one of these columns of vertices. Then you would move it up to the line, so that the contour would start to take shape. After a while, you would have something that looks like this:

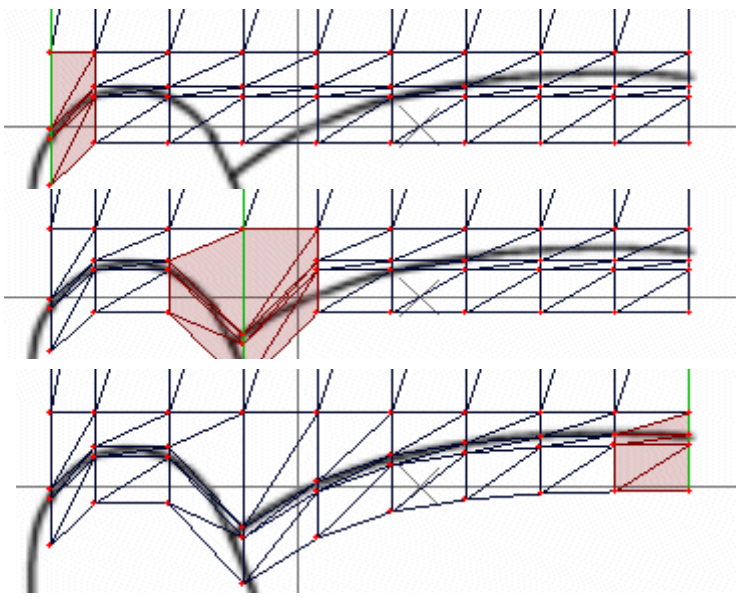
Which, as you can see, is a fairly good representation of that blueprint's contour. However, we do have a problem, don't we? If you look at the mesh from the front, it's still mostly flat. You've only extruded one contour. A car, of course, has many contours. So, your extruding work is not finished. But the principle is the same. Just for grins, let's pretend that this is our front blueprint:





This contour of the hood is not present in your mesh, so what you would do is, switch to the front, view, and, still in the Y modificatoin-axis, you would pull the appropriate vertices up or down to match these lines. Take a look:





So, the process of extruding continues. You continue looking for unextruded contours of the car until the mesh is fully extruded. It sounds easy, but this was a very, very simple example. The problem comes in when you have a lot of complex poly structures on the screen. It becomes very frustrating very fast. Also, you will not always have a cross section of each contour you have to extrude. For example, you will not find a blueprint that will show you the contour of the door, and so you will have to extrapolate that from perspective photos. Knowing the car you are making intimately at this stage is crucial.
Another tip to remember when extruding, is not to do each vertex seperately. For example, if you extrude an entire feature of a car, such as a wheelwell lip, all at one time, it will make it much more smooth. But if you do each vertex one at a time, it will tend to look "lumpy".

That's about it for extruding meshes. Now, you've learned to deal with source mateiral (blueprints), you've learned modeling policies and techniques, you've gained knowledge of how to make polygons, and then how to add the crucial 3rd dimension to them. That's about all I can teach you about actually making the polygons of the mesh. However, I do want to close with some important information about the constant goal of all modelers: accuracy.

Ensuring Accuracy

Accuracy is one of the most important aspects of a good 3d model. An inaccurate model just won't be a popular model, and does not lend to one's reputation as a modeler. Therefore, there are several ways we can make sure that we make the most accurate models possible.

The first thing that you can do is to be very specific about the model of car you want to reproduce. That way, when you search for pictures and other resources, you won't be confused by small differences. If you, for example, want to make an Alfa Romeo Guilletta, you have to know whether you want to make a GTA or a GTV. Otherwise, the confusion will lead to do disaster. Also, *only* rely on resources that relate to the specific car you are working on.
The next thing you can do to help yourself is to make sure that your tracing images line up really well. This will serve you well down the road and will not be wasted work. I promise.

Another helper for you is just regular pictures of the car. Look through fan sites and search engines for as many pictures of your car as you can. This will help you sort out the differecnes between the various models your car may come in. It wil also enable you to include every pertinent detail possible. A sub-point of that is that you should find high-resolution pictures of the car if possible. This will help you to see all those little tiny details, so there will be no gaps in your knowledge. If it's a new car, and it is within your means, go down to your local car dealer and shoot a roll of film on the car (a digital camera makes it cheaper and easier of course). Take some tracing photos, and take pictures of the details that you think will be important. Also, spend some time just *looking* at the car. You have to get to know it.

The final way to ensure accuracy is to work in high zoom in Z-Modeler. You have to make sure that you are exactly following the blueprints you have chosen. This also will alleviate some of that "inaccurate" feel of using the mouse. Another little practice that can benefit is to maximize the view that you are using. That way, it can take up the whole screen. Do this by pressing the asterisk (*) key on your numerical keypad.

Well, what a long, picture-filed, and eventful chapter! You're now on your way to making good meshes, thinking like a modeler, and ensuring the accuracy of your work. However, making models is only half the battle (in fact sometimes I think it's slightly less than half). Meshes are of very little use without textures, and the next chapter will deal with how to make the most of textures, as well as teach you how to map like a pro in Z-Modeler.